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ABSTRACT

SchoolNet is a Canadian national program designed to link electronically 300 schools in order to provide access to communications and information technology. Thirty schools in Alberta were selected as pilot sites to develop projects in science, mathematics, or technology which could use resources that enhance student learning experiences. The projects began in January, 1994 and continued until the end of May. School evaluation reports focused on pedagogical approaches, student learning, and achievement of project objectives. This report consists of four parts: a description of the Alberta SchoolNet Project with a focus on expected objectives, procedures, and outcomes; the evaluation context in which the terms of reference and the methodology for evaluation are explained; findings and discussion for the technical, educational, pre-service, in-service, and support components of the project; and recommendations for those components. A table provides SchoolNet Project summaries. Appendices include the location of participating schools in Alberta, a model for the Alberta SchoolNet Connection, and the CA*net "Backbone Configuration" on a map of Canadà. (AEF)

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EVALUATION OF THE ALBERTA SCHOOLNET PROJECT

Policy & Planning Branch
Planning, Information & Financial Services Division

July 29, 1994

Edmonton, Alberta

IR017097

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EXECUTIVE SUMMARY

SchoolNet is a national program designed to link electronically 300 schools so that they may have access to communications and information technology. Designed to provide educators with an array of resources to enhance the learning experiences of their students, participating schools were expected to develop projects in science, mathematics, or technology which could utilize these resources. In Alberta, 30 schools were selected as pilot sites from some 96 applications.

Projects began in January, 1994 and continued until the end of May. All schools were expected to submit evaluations of their projects, paying particular attention to the impact of the project on pedagogical approaches, student learning, and achievement of project objectives. The school evaluation reports were used as the basis of this final evaluation. Recommendations were provided by members of the evaluation team to address the findings of the evaluation.

Recommendations include:

1. Continuation and expansion of both the Alberta and national SchoolNet projects in the 1994-95 school year.
2. In future, schools must be cautioned that agreeing to participate in a pilot project of this type carries with it a concomitant obligation to report adequately on the project so that others may learn from their experiences.
3. Expected educational outcomes (i.e., cognitive, affective, and psychomotor) must be measured and reported by participating schools.
4. Schools participating in such future projects must become fully conversant with the interface language associated with SchoolNet and information available on this electronic highway before proceeding to access Internet. This may avoid considerable frustration in future projects.

5. Future projects should begin much earlier in the school year, preferably in October, to avoid difficulties encountered in the piloting.
6. Hardware and software requirements and operational procedures associated with each must be explained to participants in pre-service workshops. This may serve to solve technical problems before they occur.
7. Co-operation between and among the schools participating in future projects must be increased significantly to facilitate joint problem-solving and information sharing.
8. Schools participating in future projects should adopt a flexible approach to scheduling to ensure project leaders have adequate time to become familiar with protocols, operating techniques, and services available. Where possible, team-teaching should occur to enhance the projects at the schools by providing teachers with more access to services and increased technical knowledge.
9. Schools mastering the interface protocols associated with SchoolNet and requiring further information to develop projects of significance be granted full access to Internet.
10. Schools wishing to participate in future projects must assess carefully their computer and communications capabilities to ensure they are able to run the necessary applications to utilize effectively any Internet resources.
11. A simplified interface, preferably graphic, should be developed to increase ease of access for students and teachers.
12. Thorough pre-service, in-service, and on-going support for teachers should be developed for future projects.
13. Schools should be provided with more than a single-user access. In this regard, a routed network approach which would allow for simultaneous sessions by multiple users would be preferred.

14. Schools should log on to the Alberta SchoolNet once per day to receive warnings of potential shutdowns or the correction of technical difficulties.
15. Methods should be found to increase the amount of access time for schools. Schools require more time to utilize effectively the resources and tools of Internet.
16. Methods should be found to address the problem of competing for limited access to SchoolNet. Many schools found it very difficult to connect at various times of the day due to contention on the available communication ports.
17. A "Help Desk" or a single number for help should be setup and staffed with knowledgeable individuals to provide quick and effective problem resolution.
18. A "world-wide web" starting point, similar to "Ask ERIC," would be desirable for students both to limit searches and to acquire relevant information.
19. A formalized management structure needs to be developed to ensure plans for continuing and expanding SchoolNet are developed, implemented, funded, and assessed. In this regard, it is critical that a regularized source of funding be established by Alberta Education, the federal government, and local schools and school jurisdictions.

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Introduction

SchoolNet is a national project designed to link, via an electronic network, some 300 schools. The project is sponsored by Industry Canada, a number of strategic business partners, and Ministries of Education. In Alberta, Alberta Education is the formal partner in the project along with Alberta Public Works, Supply, and Services which provided electronic links to the schools.

In the fall of 1993, Alberta Education requested schools to submit an application to participate in the Alberta SchoolNet project and 96 schools responded. A selection committee reviewed the applications and identified 30 schools which best met the selection criteria. Three primary areas, each having numerous indicators, were used in the selection process:

(1) Pedagogical approach applied to the project. Indicators included:

- research
- gathering information and interpreting data
- group projects and cooperative learning
- individual study
- questioning/discussion
- experimentation
- interviewing
- writing the final report.

(2) Promotion of improved learning provided by SchoolNet. Indicators included:

- focus on research
- communication skills
- cooperative learning/information sharing
- manipulation/synthesis of data
- thinking skills

- independent learning
- information access
- stay-in-school/student motivation
- decision-making.

(3) Enhancement of achievement of Alberta curricular objectives. Indicators included:

- research skills
- communication skills
- student hands-on experiences
- responsible decision-making and problem-solving
- ethical issues
- participation skills/group work.

Technical implementation of the Alberta SchoolNet project was greatly facilitated through the donation of equipment and time by various organizations. The server was donated by Sun Microsystems and operated/implemented by Alberta Education. The communications server was donated by Cisco Systems and Gandalf and operated by Alberta Public Works, Supply, and Services (APWSS). Schools accessed the Alberta SchoolNet project by dialing into APWSS province-wide X25 network which connected them to the communications server and allowed for text-based (Telnet) sessions to the server. A single-user access, which proved to be inadequate, was allotted for each school.

Projects began early in 1994 and most were completed by late May. Based on their experiences, schools were requested to submit an evaluation of their projects to Alberta Education. There was also an expectation that a formal evaluation of the Alberta SchoolNet project would be completed by late July.

This report has been completed in accordance with project guidelines and consists of four parts:

1. A description of the Alberta SchoolNet Project with particular attention paid to expected objectives, procedures, and outcomes.

2. The evaluation context in which the Terms of Reference and the methodology for the evaluation are explained.

3. Findings and discussion for the technical, educational, and pre-service, in-service and support components of the project.

4. Recommendations for the technical, educational, and pre-service, in-service, and support components of the project.

Evaluation Team Members

Members of the evaluation team included:

- Dr. Warren Hathaway, Principal Consultant, Hathaway Planning & Consulting Services, Edmonton.
- Mr. Ralph Penno, ARnet Project Manager, Alberta Research Council, Edmonton.
- Ms. Fran Mester, Teacher, Ross Sheppard High School, Edmonton.
- Dr. Terrence Wendel, Consultant, Policy and Planning Branch, Alberta Education.

THE EVALUATION CONTEXT

Introduction

This section of the evaluation report includes the Terms of Reference and the methodology for the Alberta SchoolNet project evaluation.

Terms of Reference

The Terms of Reference for the Alberta SchoolNet project evaluation focused on:

1. An assessment of the educational aspects of the project to determine:
    - the utility of SchoolNet as an alternative to the traditional forms of delivering educational programming to students.

- the degree to which SchoolNet provided value-added educational learning opportunities to students in
  - science and technology;
  - enhancement of curricular objectives;
  - access to information;
  - completion of projects; and
  - technological competence.
- the degree to which the overall objectives of the project were achieved from both the provincial and school points of view.

2. An assessment of the technical aspects of the project to determine:
   - the utility and effectiveness of the network connection interface.
   - the degree to which hardware configurations were appropriate to the project.
   - technical limitations of the project and to suggest ways by which assistance could be provided in the future.
3. An assessment of the teacher development aspects of the project to determine:
   - the degree to which teachers were provided with support both prior to and during the implementation of the project.
4. Providing recommendations to guide actions in each of the above areas in future projects of this type.

Evaluation Methodology

Schools participating in the Alberta SchoolNet project were required to submit a self-evaluation of their respective projects by the end of June, 1994. Of the 30 schools participating, 25 submitted their evaluations. These evaluations formed the basis of the overall evaluation carried out by the evaluation committee members. Documents supplied to the schools at the outset of the project indicated that a formal final evaluation of the project would be conducted and that the evaluation would take into consideration

all data collected from the assessment reports submitted by the participating schools. Schools were requested to include, at a minimum:

- project title and description;
- staff involved in offering the project;
- date project commenced and terminated;
- reasons for implementing the project at the school level;
- objectives of the project;
- the achievement of project objectives from the school point of view and an explanation of why objectives could not be or were not achieved;
- the means by which the objectives were met;
- project status as of May 30, 1994; and
- school recommendations for future projects.

Generally speaking, school reports typically followed this format, albeit in a very sketchy manner. On the other hand, many schools simply submitted a letter describing their experiences. In future, schools must be cautioned that agreeing to participate carries with it a concomitant obligation to report comprehensively on the project so that others may learn from their experiences.

An evaluation sub-committee was struck by staff in the Alberta Distance Learning Centre and was asked to develop terms of reference for the overall evaluation. This sub-committee met on June 10, developed the evaluation terms of reference, and submitted them to the overall evaluation committee for review and approval on June 13. Since the majority of the school evaluation reports were received after June 24, the sub-committee was unable to review documents until early July.

On July 8, the sub-committee met and agreed on a report format and a methodology to acquire the necessary information. The methodology used in the evaluation is primarily

interpretive--drawing meanings from the text of others. Three primary themes, consistent with the Terms of Reference, emerged from the preliminary data analysis:

1. Educational aspects of the Alberta SchoolNet project;
2. Technical aspects of the Alberta SchoolNet project; and
3. Teacher development before and during the Alberta SchoolNet project.

Each of themes one and two had one member assigned and two members were assigned to theme three. The sub-committee met on July 14 to review a draft report which was then presented to the evaluation committee on July 15. Final revisions were made prior to formal submission on July 29.

Since the report is thematic in nature, it presents qualitative data. Where possible, quotations from the school reports have been excerpted to substantiate conclusions.

EDUCATIONAL OUTCOMES

Introduction

The objective of the national SchoolNet project is to network electronically Canadian schools to:

- enhance educational opportunities and achievements in elementary and secondary schools across Canada by making national and international education resources available to Canadian teachers and students no matter where they are located;
- foster significant improvements in learning performance by facilitating the development and electronic delivery of the most advanced and proven educational techniques through new software applications and access to electronically based resources;
- stimulate learning and produce a school graduate population with a strong command of information and telecommunications technologies, which will be the key employability skills in a knowledge-based economy;

- identify and develop new educationally relevant services from government, industry, universities and colleges, and facilitate their electronic provision to the school, teachers, and students;
- build shared learning experiences among teachers and students in schools across Canada through electronically-based educational projects; and
- stimulate the Canadian information technology, software and multi-media businesses by providing new market opportunities.

The Alberta SchoolNet project was designed to provide a small number of schools, on a pilot basis, with access to electronic resources to exploit the potential of learning technology in the classroom. Based on the principle that educators who are connected to worldwide networks have information and expertise readily available to expand the learning experiences of their students, project requirements emphasized themes in science, technology, or mathematics. Other projects adopted a social theme, exploring items of major societal concern in Canada.

SchoolNet services are based on an Internet information system called "Gopher". It is this "Gopher" which allowed 30 Alberta schools to tie into Carleton University's computer. Access to Internet and E-mail were secondary aspects of the project. Schools required appropriate technology (i.e., 9600 bps modem, Macintosh or DOS computing systems, and access to Internet). Students were not provided with individual accounts but accessed materials and projects on SchoolNet through a school-based account and at the teacher's discretion. Some 100 resources (e.g., NASA Database) were drawn from Internet and placed in SchoolNet for schools to access. Many schools chose to access information from Internet for other projects despite the difficulties associated with establishing an Internet interface. Indeed, many school projects, as they evolved, could not have been completed without accessing Internet. However, it should be noted that the projects, as originally designed by the schools, could have readily been completed through SchoolNet. SchoolNet also provided a series of discussion forums where schools

posted their own projects to share with others. In this way, SchoolNet encouraged the further development of Canadian sources of data.

Outcomes

Achieving the objectives of SchoolNet may be achieved more easily within the context of a new educational paradigm rather than in the present educational paradigm. The difference between these two paradigms lies in sources of information and the roles of teachers and students. These two paradigms are contrasted in Figure 1. Part of the evaluation of the Alberta SchoolNet project must address the issue of movement towards the technologically-enhanced educational paradigm.

The evaluation of the Alberta SchoolNet project also is compounded by a host of uncontrollable variables. While the intent is to shape the evaluation around the intended objectives, a number of contaminating variables are apt to creep in. Among these variables are hardware, software and organizational factors which may affect any of the intended outcomes--outcomes in the cognitive, affective, or psychomotor domains. Few steps were taken to ensure that expected educational outcomes (i.e., cognitive, affective, and psychomotor) were accurately measured--or measured at all. When it comes to the unintended outcomes, control was almost impossible. So also with that contaminating variable that creeps into all evaluations--the "Hawthorne effect"--where those associated with a project are influenced, either positively or negatively, by it. It is impossible to determine whether the positive results of the Alberta SchoolNet projects were the result of planned initiatives, related to the introduction of new hardware, software, or organizational practices, or simply the result of being involved in doing some different things. A further issue also emerged: Should access to Internet by schools which master the access protocols be unrestricted, thus providing students with access to both desirable and undesirable data files, or should schools provide limited access to students and run the risk of being accused of censorship?

Figure 1

Models of Education

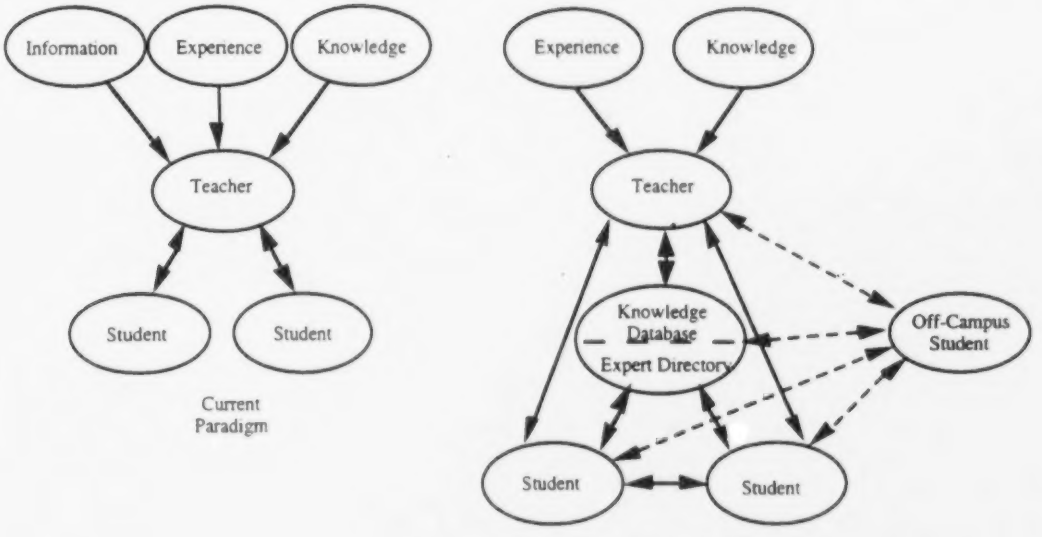

Table 1 provides an overview of each of the projects and suggests that most projects made significant strides towards achievement of planned objectives. Unfortunately, these overviews fail to describe adequately both the ambition and imagination contained in many of the projects. Project reports were not received from those schools where only school and project names are recorded.

Intended Outcomes

Cognitive outcomes. Few of the projects actually measured any sort of cognitive outcomes. At the same time it must be acknowledged that most projects reported that some or all of their curricular objectives were achieved.

Affective outcomes. Beyond reporting that students, for the most part, enjoyed the potentials offered by SchoolNet, only one school actually addressed outcomes in the affective domain. That school (Niton Central School) provided some interesting insights into outcomes related to the affective domain.

The project leader said, "Networking has actually helped these students develop interpersonal skills in a safe and caring manner. 'Netiquette' has become their responsibility and careless personalities have been chided for their tom-follery."

One of the students reported, "I learned how to talk politely to others who are logged-on and found that talking to people who don't swear is nice."

Psychomotor skills. Implicit in the reports is the observation that students learned enough keyboarding skills to successfully function in SchoolNet.

Table 1. SchoolNet Project Summaries

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
Clive School, Clive County of Lacombe	• Sovereignty Vs Federalism: Canada new Direction?		• Many project objectives were fully achieved. • Unable to meet prime objective—"to make a sound prediction for Canada...regarding how the Constitutional crisis will be resolved."	• Unable to obtain data from outside Alberta—probably due to late start and time conflicts.	• SchoolNet should be developed as a base for discussing the Constitution and other regional and national issues.	• "We are somewhat exhausted and frustrated by how things turned out.... [and] we are extremely proud of what we were able to accomplish this year."
Eastview Elementary School, Red Deer Red Deer School District (Grade 8, four classes)	• 1. Asthma • 2. Recycling Around the World	• Taming the Tube (Ottawa)	• Only partial success because of a lack of time	• Long learning curve on SchoolNet • Too few projects on School Net to arouse interest	• Better software • Better management of e-mail	• "...Consider SchoolNet a worthwhile project and looking forward to continuation in 1994-95."
Ecole Kingsland School, Calgary Public School District	• Science Simulation in 2020					
Edwin Parr Composite School, Athabasca County of Athabasca	• The Logging Industry					
F. R. Haythorne Junior High School, Sherwood Park County of Strathcona	• Micro-organisms and Illness: A National Perspective	• Asthma Project	• Limited success due to lack of response to request for information	• Long learning curve for SchoolNet • A late start and short timelines moved the project into exam time. This interfered with responses.	• More information about SchoolNet • Better directory of resources and educational contacts • Future projects should be more modest in scope and more manageable	• Students enjoyed "net pals" and "...gophering around 'just looking' at 'neat' things."
Father Mercredi Community School, Ft McMurray Ft. McMurray RCSSD	• Study of National Identity		• Nominal success.	• Log-on procedures • Use of Gopher and maneuvering through SchoolNet are difficult. • Generally an unfriendly user interface. • On-screen messages are often confusing.	• "...Development of a more user-friendly interface which will allow users to concentrate on searching for and accessing desired resources."	

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
Glendale Junior High School, Red Deer Red Deer School District (Grade 8, 30 students)	• Study of Brazil—Amazon Rain Forest Depletion		• Successfully completed most objectives	• Too little time devoted to preparation of teachers and students to use SchoolNet • System busy during March and April—access difficult		• "We hope to continue to build and update our project in the coming years."
Hythe Regional Junior High School, Hythe County of Grande Prairie	• Characteristics of Flight					
James Fowler High School, Calgary Calgary School District	• Smoking and Your Health					
Kitscoty Jr /Sr. High School, Kitscoty County of Vermilion River (Grade 7 and 8 classes)	• Environmentally Friendly Winter Olympic Games		• Project objectives achieved.		• Recommend "chat" programs on selected topics and on-line conferences.	
Lacombe Upper Elementary School, Lacombe County of Lacombe (Grade 6 class, 28 students)	• Energy Resources and Conservation		• Most (and all curricular) objectives were met.	• "Internet was too complicated for students to navigate themselves."		• "...SchoolNet provides a fantastic opportunity for teachers and students alike."
Lakeview Elementary School, Lethbridge Lethbridge School District	• Recycling	• Scaled down project to encourage participation by other schools	• Objectives met	• "Project has a long learning curve."	• "SchoolNet personnel should suggest softweare packages."	• "We consider SchoolNet a worthwhile project and want to continue."
Livingstone School, Lundbreck Pincher Creek School Division	• Alternative Energy		• Incomplete as of May 30, 1994	• Trying to use a new medium that most contributors are unfamiliar with	• More and better in-servicing • Improved password control	• "...We should be able to turn this medium into a practical resource for teachers and students."
Malmo Elementary School, Edmonton Edmonton School District (K-6 participants)	• Animal Survival	• Taming the Tube, World School Wildlife Adventures, Arctic Expedition, Family Feud, Mayflower Mall, Favorite Subject Survey, Recycling Questionnaire, Telecommunications Survey, Canadian Fest	• Unspecified	• Difficulty getting started. A primitive ELM and two versions of PINE were contributors to the problem. • Technical problems of accessing and maintaining connections • Too little technical documentation	• Greater sense of group among schools on SchoolNet—greater willingness to participate in projects from other schools	• Found Kidlink messages very interesting.

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
Medicine Hat High School, Medicine Hat Medicine Hat School District (Small cohort of students)	• 1. Science and Technology Writing Contest • 2. Gathering and Sharing Information		• Science & Technology Writing Contest abandoned.	• E-mail problems • Lack of supporting resources (e.g., contest prizes)		• With respect to the utility of SchoolNet, "...For just about all resources available via SchoolNet, there is an alternative locally available in the form of a book, periodical, or CD ROM."
Meyonohk Elementary School, Edmonton Edmonton Public School District (Levels 5 and 6, 34 students)	• Energy Consumption in School		• Project objectives were not achieved.	• Local school issues (e.g., budgets, school reorganization) minimized the time that teachers could spend on the project.	• "Do not abandon these SchoolNet initiatives after only one year's trial!	• "Our lead teachers and our students are most keen to participate in further tele-communications activities.
Milo Community School, Milo County of Vulcan	• Earthworm count			• "I have become very flustered and 'turned-off'. My expectations were never met."		• "As a result of a workshop, I was able to get the students more involved with the system in my science classes."
Morrin School, Morrin (Several classes and grades) Starland School Division	• Global Village News		• Objectives were met, but not as originally planned.	• Time and timetable restrictions were a factor. Some independent learning resolved the problem to a degree.	• As new projects and initiatives are introduced, there must be a way for teachers to cut out other parts of the curriculum.	• "Our students learned many positive things from the experience....We hope that an independent learning model will allow our students freedom to pursue their interest and find the resources in a way that best meets their needs."

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
Niton Central School, Niton Junction Yellowhead School Division (Grade 4 and 6 students) (Junior High) (Senior High)	• 1. The Impact of Science and Technology on Our Environment • *2. Waste Minimization* Project • 3. Statistics		• Projects 1 and 2 in progress as of May 30, 1994. • Project 3 completed	• Lack of time to carry out projects as planned.	• All students can benefit from SchoolNet. • Provide more time to *plan and complete* projects.	• "Networking has actually helped these students develop *interpersonal skills in a* safe and caring manner. 'Netiquette' has become their responsibility and careless personalities have been chided for their tom-foolery." • A student said, "I learned how to talk politely to others who are logged-on and found out that talking to people who don't swear is nice."
Olds Jr /Sr. High School, Olds County of Mountain View	• International Technology Education Project (part of Career and Technology Studies—CTS)		• Abandoned the SchoolNet link and are pursuing an Internet connection. • The use of e-mail was successful—279 users, 9-10 MB of information in and out of the BBS daily through Internet.	• "During the first three months we attempted calls via the Red Deer access number 73 times during school hours. We were successful in only three of these."		• "...I can see little value continuing to plan to use SchoolNet for this CTS program in this location.
Peace River High School, Peace River Peace River School Division	• Population Biology Study					
Pembrooke Meadows School, Calgary Calgary School District	• Weather					
Pioneer School, Rocky Mountain House Rocky Mountain School Division (Grade 7)	• Baby sitting Study		• Some objectives met.	• Lack of time was a problem.		

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
Prairie River Junior High School, High Prairie High Prairie School Division	• International Poetry/Writers' Guild original project. • Alternate: E-Mail Pen-Pal club		• Students learned about Internet resources and E-Mail. • Provide students with a context for writing. • Improved students' ability to gather, process, and share information.		• Suggest SchoolNet access be encouraged for a wider group of Alberta Schools, perhaps with a small user fee in place.	• We share with the other schools a strong interest in continuing with SchoolNet for the 1994-95 school year. We feel that we have had access to information what would have been very difficult for us to get in any other way, due to our somewhat isolated location. Our students have thoroughly enjoyed the easy interaction with other students and have learned much about online research. • Don't let SchoolNet die.
Rio Terrace School, Edmonton Edmonton School District (One Grade 4/5/6 Class in regular program; one Grade 5 French immersion class)	• Hello, Bonjour! Quel Temps Fait'il?		• Project suspended. • SchoolNet use to correspond with some schools in Eastern Canada	• Difficulties with communicating. • No responses to project which was posted in April	• More in-service time and longer periods of time to complete projects are essential.	• "...Our over-riding comments is that we found the SchoolNet connection extremely exciting."
Ross Sheppard High School, Edmonton Edmonton School District	• 1. Determine the Size of the Earth • 2. Determine UV Profile for Canada • 3. Jet Stream Project		• Projects were completed or remain in progress.	• Lack of in-service, adequate documentation, and a "help" line.	• Province-wide help and discussion group. • Better in-service (i.e., more hands-on). • Directories of information available on SchoolNet or Internet.	• "...Look forward to continuing in this direction now that we have our feet wet."
Sexsmith Secondary School, Sexsmith County of Grande Prairie (Two Grade 7 classes, 55 students)	• Erosion		• Objectives were partially met.	• Difficult to train students in intricacies of SchoolNet.		• "...SchoolNet system was not as user-friendly as anticipated. Because of this many of the objectives were not met."
Sherwood Heights Junior High School, Sherwood Park County of Strathcona	• Technology, Education and the Quality of Life		• The project was completed and the summary report posted on Internet under the SchoolNet Gopher.	• Delayed start to projects. • Problems with E-mail in the pre-PINE days. • Resorted to courier services to get materials to project participants.	• Provide more project lead time and more training for future projects.	• "We have thoroughly enjoyed participation in SchoolNet.

School	Project(s)		Results	Problems	Recommendations	Comments
	As Originator	As Participant				
St. Jerome's School, Vermilion Vermilion RCSSD (Multiple grades)	• Weather		• Projects had satisfactory outcomes.	• Crashes, freezing up the screen, text editor, down-loading GIF files, and ignorance of workings of Internet in general. • Subscribe and Unsubscribe routines. • Knowing when to use Telnet or FTP	• Provide an opportunity for debriefing of project participants. • Continue with SchoolNet in 1994-95. • Provide further in-service programs for those who have been involved in SchoolNet for a while—an opportunity to base the in-service on some experience.	
St. Joseph Composite High School, Edmonton Edmonton RCSSD (Two Math 30 classes, 50 students)	• 1. NASA Project • 2. Statistics Project		• Successful completion of Project 1. • Project 2 is on-going		• Teachers should be reasonably capable of using SchoolNet before trying to get the students using the network. • Continue the availability of SchoolNet/Internet for schools. • Extend in-service.	• "Overall, the project was thought to be both useful and successful. Students were enthusiastic and enjoyed the whole experience."

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Unintended Outcomes

Like the intended objectives, the unintended objectives may also fall into the three domain--cognitive, affective and psychomotor. Equally, the unintended objectives may be closely linked to hardware, software, or even shifts in organizational structures.

Clearly, the hardware and software, for the most part, were mastered to the extent that they were useful as new tools in the processes of teaching and learning. However, the potential of these tools is probably only scratched--responses from almost all of the project sites suggested optimism and a strong desire to continue using these tools.

Many of the resources found and used in the reported projects came from Internet and not directly from SchoolNet. This may be considered as either positive or negative. It may suggest that SchoolNet provides direct access to an array of information resources deemed to be too limited by teachers and/or students. It also may suggest that SchoolNet provides an easy connection to a much larger world of information (i.e., Internet).

It is also important to note that the need for organizational changes were beginning to emerge in at least one school. The project leader at Morrin school reported,

> The objectives of the "Global Village News Project" were not met as I first envisioned them. The real problem was the amount of work required to launch such an endeavour. Our timetable prevented the team teaching approach that would be necessary to carry it through. We have decided to go ahead with an independent learning model in our school though. This is significant for it indicates our school's willingness to undergo systemic change to accomplish technological integration!

Problems

A number of problems arose which constrained many of the projects from achieving their full potential. A delayed start to the projects placed many of the projects in conflict with

other activities in the latter part of the school year--particularly exams. The delayed start also shortened the time available for planning the projects and for obtaining sufficient in-service and training. Technical problems also occurred: The hardware and software were unfamiliar to many and a number of sites experienced difficulty gaining access to SchoolNet.

A number of sites also reported a lack of co-operation among the schools participating in the national SchoolNet and this lack of co-operation made completion of projects difficult.

Summary

Four major problems were noted which reduced the effectiveness of the SchoolNet projects conducted in the 1993-94 school year: A late start pushed projects too close to traditional year-end activities; there was too little time to plan and implement projects; too little in-service occurred prior to launching projects; and technical (i.e., hardware, software, and access) problems arose.

In spite of these problems, most project participants remain undaunted. They see great potential in projects like SchoolNet and, almost unanimously, pleaded for the continuation of the SchoolNet projects in the 1994-95 school year. Many want full access to Internet.

Finally, one of the implied objectives of the SchoolNet project was to enable development of a new educational paradigm. Clearly, the results of the present SchoolNet projects suggests that some gains were made in this area.

EVALUATION OF THE TECHNICAL ASPECTS OF THE ALBERTA SCHOOLNET PROJECT

General Comments

The original project in Alberta was implemented under a very short time frame with little to no resources and a very small amount of funding. These had impacts upon the schools participating in the Alberta SchoolNet project and these were reflected in the evaluation reports received from the schools. After analyzing the reports from the schools, the following technical problems emerged:

1) Technical problems at the school level.
2) Technical problems at the communications supplier level.
3) Technical problems encountered at the server level.
4) General technical problems.

There are a number of recommendations that follow the summary of technical problems. However, the main and common point from all schools involved was that the Alberta SchoolNet project was a very worthwhile endeavour and that they would all like to see a continuation in which they and others would be able to participate.

Assessment of the Technical Component of the Alberta SchoolNet Project

1) <u>Technical problems at the school level:</u>
   - A number of schools used a Macintosh interface which has a graphical user interface. The interface being used for SchoolNet was a text-based interface utilizing primarily DOS and UNIX based commands.
   - School computers were too slow and outdated to run the necessary applications to utilize any Internet resources effectively.

- Communications program incompatibility, as well as a lack of technical communications knowledge to properly setup and trouble shoot communications problems added to the difficulties.
- Problems with local mail interface were experienced.
- The most common problem was not technical, but rather a matter of training and experience. Most participants were unaware of how to use the tools available to them or as to where they should turn for help. Many said that the learning curve was too steep for the time allotted. It was difficult enough for the teachers, let alone the students, to become proficient at using Internet.

2) Technical problems at the communications supplier level

- Schools found it very difficult with a single-user access to SchoolNet when teaching a class. A routed network approach which would allow for multiple users at the same time would be preferred.
- Schools reported feelings of frustration when the network was shutdown for maintenance. However, advance warnings of maintenance were given over the SchoolNet. To receive those warnings, schools had to be logged on to the SchoolNet.
- Schools found that the limited amount of access time was a problem. They required more time to utilize effectively the resources and tools of Internet.
- Contending for access was also a problem for the schools. Many found it very difficult to connect at various times of the day due to contention on the available communication ports.
- Students who worked on projects during the school day found it difficult to gain access to SchoolNet or Internet. As a

consequence, those who had computer equipment at home would attempt access in the evenings. Many of the resources available on the Internet have limited access during the day; accessing the required information after hours was a necessity.

3) Technical problems encountered at the server level

- Set up of file transfer areas took a long time.
- Set up of a user-friendly mail interface was needed although the mail was a secondary aspect of the Alberta SchoolNet project.
- There were problems connecting to other resources via the main menu system.
- The text-based interface procedures were too complicated for young students. The interface needs to be simplified and made more user-friendly, perhaps through adapting an existing interface program to be icon driven.
- Although assistance was available on a limited basis, schools clearly stated a need for a full time Alberta "Help Desk". This would give users some place to call for help with both technical and resource questions, and assurance those concerns could be addressed.
- Small technical problems with the PINE mail program with the printing and spell commands also were evident.
- Some projects would have benefited from access to a broader range of Usernet news groups.

4) General technical problems

- Many schools went beyond resources and accessed the greater resources of the Internet. This required great expertise and understanding of the Internet and the tools associated with it.
- A huge learning curve accompanied the new resource and tools.

Recommendations for the Technical Component

The following recommendations are offered:

1) More stringent guidelines or standards are required for participation (i.e., minimum computer, minimum communications equipment, standard software suite for multiple platforms).
2) Network connectivity to the schools for multiple simultaneous sessions is required.
3) More in-servicing and hands on training should be mandatory before teachers are allowed to access and use Internet.
4) Graphical user interfaces (e.g., Mosaic) should be provided for both Macintosh- and Windows-based machines.
5) Server and services should be setup and tested before being put into production.
6) A "Help Desk" or a single number for help should be set up and manned with knowledgeable staff for quick and effective problem resolution.
7) Network protocols need to be developed, communicated to schools, and then followed by the schools. Sanctions for non-compliance also must be considered.
8) A "world-wide web" starting point, similar to "Ask ERIC", would be desirable for students both to limit searches and to acquire relevant information.

(9) The development of a network maintenance schedule allowing for maintenance outside of regular school hours would alleviate the frustration felt by many schools over network shutdown.

The final recommendation to be put forward is to continue with the Alberta SchoolNet project and to implement as many of the above recommendations as possible, focusing on training and hands on experience.

EVALUATION OF PRE-SERVICE, IN-SERVICE, AND SUPPORT FOR TEACHERS IN THE ALBERTA SCHOOLNET PROJECT

General Comments

The opportunity to participate in the Alberta SchoolNet project, with its access to the Internet, was greeted with enthusiasm and excitement. A chance to be involved in a pilot project using new technology which allowed the schools to venture onto the rapidly changing electronic highway was a challenge embraced by all, despite the fact that the degree of expertise and confidence in working with computers varied greatly among the sites.

The initial excitement was tempered, in the early stages of the initiative, by difficulties with E-Mail and technical delays coupled with operator inexperience. As a result, many project leaders and teachers experienced a period marked by frustration. Frustrations arose initially in configuring the site system and, ultimately, in the effective use of SchoolNet and, particularly, Internet. Many participants expressed the feeling that they lacked the knowledge and understanding of the power and scope of Internet and how to tap into these resources. Navigating through such a complex system proved to be more of a challenge than first anticipated.

Despite the initial problems and setbacks, those schools that persevered were generally very positive about their experiences and enthusiastic to continue participating in the project in the fall of 1994. They felt their investment of time and energy in the initial

phase of the project warranted the opportunity to expand on what they had learned. A teacher summed up the feelings of many when he reported, "Those who took the challenge to venture around the learning curve of this electronic highway have found it a most rewarding experience." Also, there is little doubt that schools new to the SchoolNet project require nurturing and "hand-holding", to a certain extent, until they become comfortable with the new technology. The desire to continue the Alberta SchoolNet project and, indeed, to expand its scope, have implications for this required support.

Teacher Pre-service, In-service, and Support

All participating schools met on January 25 at a number of different sites throughout the province. The video-teleconferencing was an interesting experience and served to introduce participating schools and key support personnel to each other. The workshop was informative but, unfortunately, the SchoolNet system was not completely operational at that point in time. As a result, no hands on experience was available for participants. This was a limitation in providing the pre-service knowledge teachers needed.

Timing has been an important factor throughout the project. Timelines were short from the beginning to the end of the Alberta SchoolNet project. Several schools expressed feelings of pressure to get started on their projects before they had time to learn the system and feel confident navigating it. Technical delays further complicated the start up of projects and, in some cases, served to discourage potential users. Access during March and April proved difficult for some locations as the system was very busy. This severely limited the full utilization of the telecommunications technology for both teachers and students and complicated its use during scheduled class time. City schools with multi-line access did not experience as much difficulty. During the last two months of the project, access was easier but, by this time, it was too late for some projects. Teachers were reluctant to begin or participate in projects running near the end of the school year.

While a number of the problems experienced were universal and others were unique to the individual site, all led to confusion and frustration. Problems included crashes, frozen screens, difficulties using the Internet resources, and downloading the FTP/Telnet files. The change from ELM to Pine helped alleviate some of the initial problems with E-mail. Several sites complained that the system was not user-friendly and was intimidating for the novice. Lower grade levels, in some schools, experienced difficulties traveling the Internet and were unable to perform some of the functions without direct supervision. On the other hand, some learned how to download GIFF files showing the Antarctic ozone hole over a period of years and used the Macintosh "Quicktime" movie to make a movie.

Many teachers wished to mention specifically the assistance provided by Bernie Simoneau, Ken Robitaille, Diane Pon, and other personnel.

Conclusions

The learning curve associated with mastering the intricacies of SchoolNet and then Internet was very steep. More experience was needed to realize fully the potential of the electronic highway. The amount of time to learn and use the system was too short. A more reasonable time frame would be one year.

There is a wealth of information available on the electronic highway, much of which is not always easily accessible to the novice user. Cursory and exploratory access to network information systems in general, and with SchoolNet and Internet in particular, while desirable to build a comfort level, are not sufficient for users to become competent in information retrieval. Consequently, it is necessary to have these services available on an on-going basis to utilize fully the information potential of the electronic highway and the expertise of both teachers and students acquired over time.

This project brought together staff in all disciplines and gave students an active and interactive role in learning what technology has come to encompass and its impact on our

lives. However, schools need at least one individual heavily committed to the project to maintain the system and to assist in creating and completing projects. Even though some highly knowledgeable personnel were available, schools still had difficulties (e.g., Internet). Unless teachers are aware fully of what is available and can readily access and easily extract the material they need, they will not become committed users.

Alberta personnel may want to suggest to participating schools a number of software packages that work well with their system and various computer packages . Further, it is difficult to teach a class how to maneuver through the complexities of the system with a single computer-modem unit. The freedom of undertaking one's own project is exciting, but also daunting.

Recommendations for Teacher Pre-service, In-service, and Support

1. The Alberta SchoolNet project should be continued to give schools the opportunity to complete their projects and fine tune other aspects of their SchoolNet usage.

2. Hands-on pre-service activities and on-going in-service opportunities would be very useful for potential users in helping to diminish the frustrations caused by the steep learning curve.

3. An on-line tutorial for basic navigational tools would be desirable.

4. The creation of a local user help group or access to a local help line would be beneficial in offsetting difficulties experienced by the users once they return to their schools. This consultation could be in the form of a toll-free number or an E-mail help address.

5. An experienced person should be selected to act as a monitor to oversee a province-wide discussion groups or conferences via E-mail on topics of concern to all our Alberta users.

6. At the provincial level, it would be desirable to have in place a counterpart of the "Electronic Village" initiative now going on in Ontario. This also would provide each teacher in the province with toll free access to BBS.

7. At the national level, the group could give more thought to the specific curriculum needs of Canadian students and educators. A first step could be to make the curriculum documents and guides and other support documents from the Departments of Education available electronically.

8. A database should be created so that teachers and students could add resources as they find sites/resources of value.

9. Participants in the pilot project should meet to share the successes and concerns of their experiences and to acquire professional and expert advice now that they have sufficient background to relate to what is being presented. Experience gained through the project would facilitate enhanced understandings.

RECOMMENDATIONS

Introductory Comments

Most readers of evaluation reports tend to read the recommendations before the main body of the report. To facilitate this desire, and to provide a summary of all recommendations found in the report, this section has been provided. Essentially, this section is a restatement of recommendations in the body of the report.

Recommendations

1. In future, schools must be cautioned that agreeing to participate in a pilot project of this type carries with it a concomitant obligation to report comprehensively on the project so that others may learn from their experiences.

2. Few steps were taken to ensure that expected educational outcomes (i.e., cognitive, affective, and psychomotor) were accurately measured--or measured at all. When it comes to the unintended outcomes, control was almost impossible. Consequently, it is recommended that more accurate measuring of outcomes occur at the school level and that the results of the measurements be included in the evaluation reports from the schools.

3. Many of the resources found and used in the reported projects came from Internet and not directly from SchoolNet. It may suggest that SchoolNet provides direct access to an array of information resources deemed to be too limited by teachers and/or students. It also may suggest that SchoolNet provides an easy connection to a much larger world of information (i.e., Internet). Notwithstanding the previous comments, it is recommended that schools participating in such future projects become fully conversant with the interface language associated with SchoolNet and information available on this electronic highway before proceeding to access Internet. This may avoid considerable frustration in future projects.

4. A delayed start to the projects placed many of the projects in conflict with other activities in the latter part of the school year--particularly exams. The delayed start also shortened the time available for planning the projects and for obtaining sufficient in-service and training. It is recommended that future

projects begin much earlier in the school year, preferably in October, to avoid difficulties encountered in the piloting.

5. It is recommended that hardware and software requirements and operational procedures associated with each be explained to participants in pre-service workshops. This may serve to solve technical problems before they occur.

6. On a national level, it is recommended that co-operation between and among the schools participating in future projects be increased significantly to facilitate joint problem-solving and information sharing. While there is a central responsibility for providing assistance, individual school sites also have a responsibility to share expertise, knowledge, and skills.

7. It is recommended that schools participating in future projects adopt a flexible approach to scheduling to ensure project leaders have adequate time to become familiar with protocols, operating techniques, and services available. Further, team-teaching would enhance the projects at the schools by providing more access to services and increased technical knowledge on the part of the teachers. Technological integration must be facilitated with attitudes conducive to independent learning.

8. It is recommended that Alberta continue participating in the SchoolNet project. There was virtual unanimity from participating schools about the great potential of SchoolNet and a desire to continue the SchoolNet projects in the 1994-95 school year.

9. It is recommended that schools mastering the interface protocols associated with SchoolNet and requiring further information to develop projects of significance be granted full access to Internet.

10. It is recommended that schools wishing to participate in such projects in the future carefully assess their computer and communications capabilities to ensure they are able to run the necessary applications to utilize effectively any Internet resources.

11. It is recommended that a simplified interface, preferably graphic, be developed to increase ease of access for students and teachers.

12. It is recommended that a thorough pre-service, in-service and on-going support program for teachers be developed for future projects. This will alleviate problems caused by a lack of training and experience, lack of knowledge of the tools available, accessing assistance while the project is underway, and the problem of learning much in a very short time while projects are underway.

13. It is recommended that schools be provided with more than one address and telephone line to facilitate access. In this regard, a routed network approach which would allow for simultaneous use by multiple users would be preferred.

14. It is recommended that schools log on to the SchoolNet once per day to receive warnings of potential shutdowns or the correction of technical difficulties.

15. It is recommended that methods be found to increase the amount of access time for schools. Schools require more time to utilize effectively the resources and tools of Internet.

16. It is recommended that methods be found to address the problem of contention. Many schools found it very difficult to connect at various time of the day due to contention on the available communication ports.

17. A "Help Desk" or a single number for help should be setup and staffed with knowledgeable individuals to provide quick and effective problem resolution.

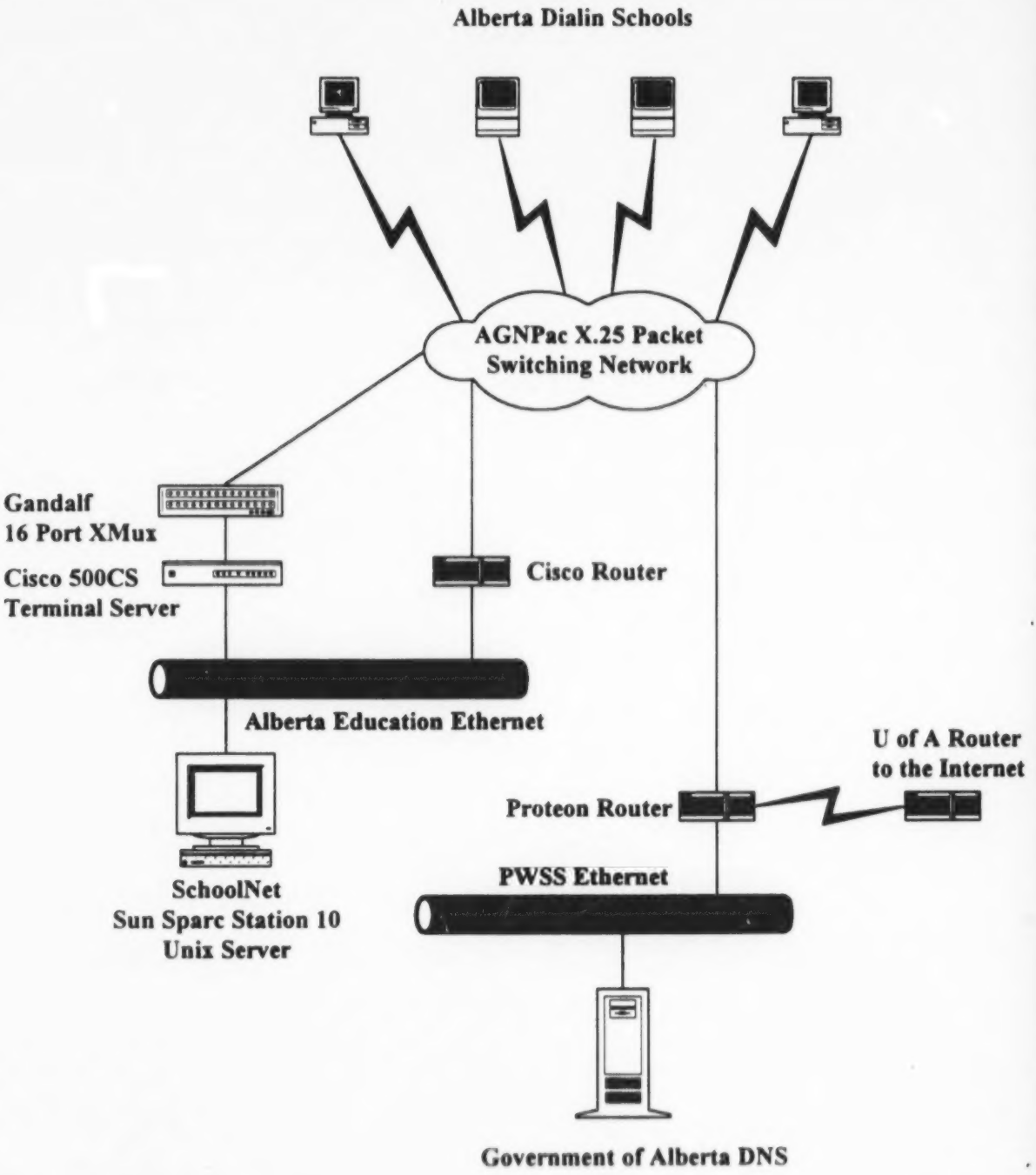
18. A "world-wide web" starting point, similar to "Ask ERIC", would be desirable for students both to limit searches and to acquire relevant information.

Appendix A

Participating SchoolNet Schools in Alberta
Fort McMurray
Peace River
High Prairie
Hythe
Sexsmith
Athabasca
Sherwood Park(2)
Vermilion
Niton Junction
Edmonton(5)
Kitscoty
Clive
Lacombe
Rocky Mountain House
Red Deer(2)
Olds
Morrin
Calgary(3)
Milo
Medicine Hat
Lethbridge
Lundbreck

Appendix B

Model for Alberta SchoolNet Connection



Appendix C

CA*net Backbone Configuration